APPENDIX.

[Vide answer to starred question No. 631 asked by Sri K. Parthasarathy at the meeting of the Legislative Assembly held on 11th February 1955, page 262 supra.]

Particulars of the water pump designed by the Madras Agricultural Department to be worked with bulls.

Though pumps driven by oil engines and electric motors are the most efficient means available for lifting water for irrigation, they still remain out of the reach of several thousands of small farmers owning or cultivating only a few acres because, the cost of these engines in terms of the financial resources of such farmers continues to be prohibitive. Every farmer necessarily maintains a few bullocks to do his ploughing and carting and this work does not engage these animals all the year round. Hence if a cheap and fairly efficient water lift which could be operated by a pair of bullocks could be devised, many small farmers would consider it as a welcome addition to their equipment. It was with the object of providing such a water lift that two models of bullock pumps were designed by the Agricultural Research Engineer at the Agricultural College and Research Institute, Coimbatore. These two pumps are similar to the South Arcot circular mhote and the ordinary conventional bullock mhote. Particulars about these models are given below.

2. *Bullock Pump Model No.* I.—The open well model of this pump consists of two six inches pipes let down vertically into a well and clamped side by side about three feet apart to a wooden beam placed across the well at ground level. The two pipes extend a few feet below the water level and the top ends project six feet above ground level. The delivery outlet is provided at two feet below the top, i.e., at four feet above ground level. A leather flap is fitted at the bottom of the two pipes and two plungers work inside these vertical pipes. The plungers are operated by means of wire ropes. One end of each of these ropes is attached to a plunger. The ropes are then brought up through the pump barrels and over two pulleys fitted on two brackets fixed to the top of the barrels. The wire ropes then diverge horizontally to pass through the pulleys mounted on two posts situated diametrically opposite to each other on the edge of a bullock track. After passing through these pulleys the two wires are brought together to a common terminal through a swivelling block on a rotating beam at a distance of four and a half feet from the centre of rotation.

The rotating beam is mounted on a central pivot post fixed rigidly to the ground at the centre of the bullock track. A pair of bullocks is hitched to the free end of the rotating beam at a distance of about 12 feet from the centre of rotation.

When the bullocks go round the track, the central beam rotates and plungers move up and down the barrels, alternatively. Each barrel discharges once during each rotation of the beam.

[11th February 1955

A pair of average bullocks can go round $2\frac{1}{2}$ to 3 times per minute without undue strain and thus the total discharge will be about 2,700 gallons per hour. The cost would be Rs. 675.

The tube well model of this pump is very similar to the open well model. Each barrel in this model consists of a tube well filter point installed below ground level where coarse sand strata bearing sufficient water is available. The filter point is connected to a pipe which extends up to the required depth below ground level. At this level a check valve is provided. The pump barrel consisting of a pipe and a plunger is screwed on to the top of the check valve. The rest is same as that of an open well model. The cost would be about Rs. 775.

3. *Bullock Pump Model No. II.*—The tube well model of this pump consists of a filter point tube well installed below ground level at a depth where a course sand medium bearing sufficient water is available. The strainer is connected to a pipe which extends up to the required depth below ground level. A valve is provided at the required depth depending upon the stroke of the plunger over which a pump barrel with plunger is attached. Generally the top of the pump barrel is three feet above ground level. The delivery is provided at one foot below the top of the barrel, i.e., two feet above ground level. A cast iron cylindrical plunger works inside this barrel, up and down by means of a wire rope attached to the plunger and run over an iron pulley located in a bracket fixed to the top of the barrel. The free end of the wire rope is tied on to the middle of a wooden yoke. The yoke is placed on the necks of the pair of bullocks which operate the pump by walking up and down a ramp having gradient of one in five similar to that of a conventional bullock mhote. The cost will be between Rs. 200 and Rs. 250 per pump approximately.

A similar pump can be used for open well with equal advantage where the tube well strainer is eliminated and the pump would require to be rigidly fixed in a vertical position inside the well. This can be done by champing the unit to a wooden beam placed across at the top of well. The discharge will be about 3,000 gallons per hour. The cost of the pump is approximately Rs. 200 to Rs. 250.

4. The similar design, cheaper cost and increased output of Model No. II is an improvement over Model No. I.

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